

# **Water to Protect Fish and Wildlife in the North Fork of St. Lucie River**

## **Water Reservation Rule Development**

**Governing Board Workshop  
September 9, 2009**

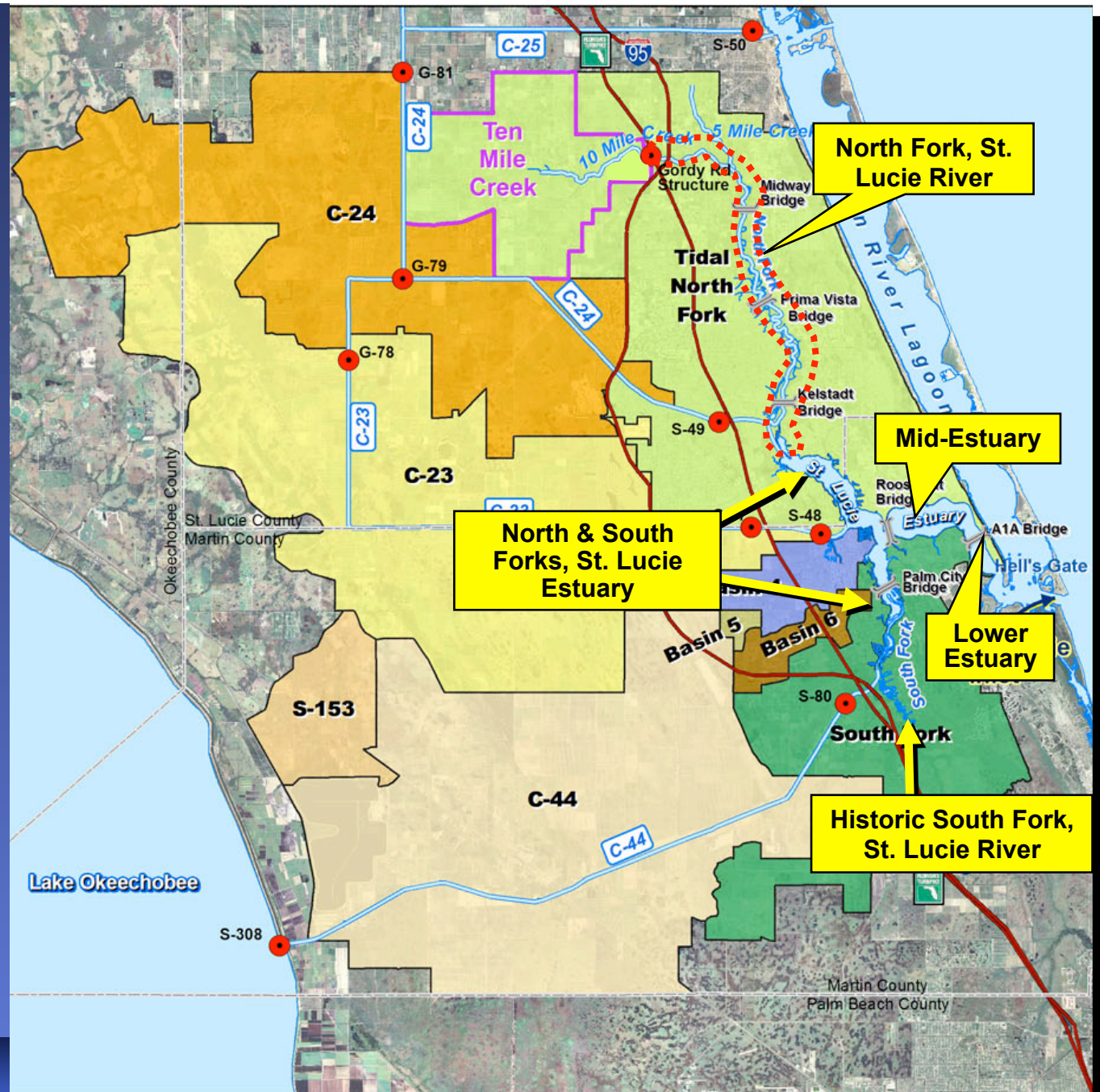
**Dave Swift  
Lead Environmental Scientist  
Everglades Restoration and Capital Projects**



**[sfwmd.gov](http://sfwmd.gov)**

# St. Lucie Estuary Watershed Map

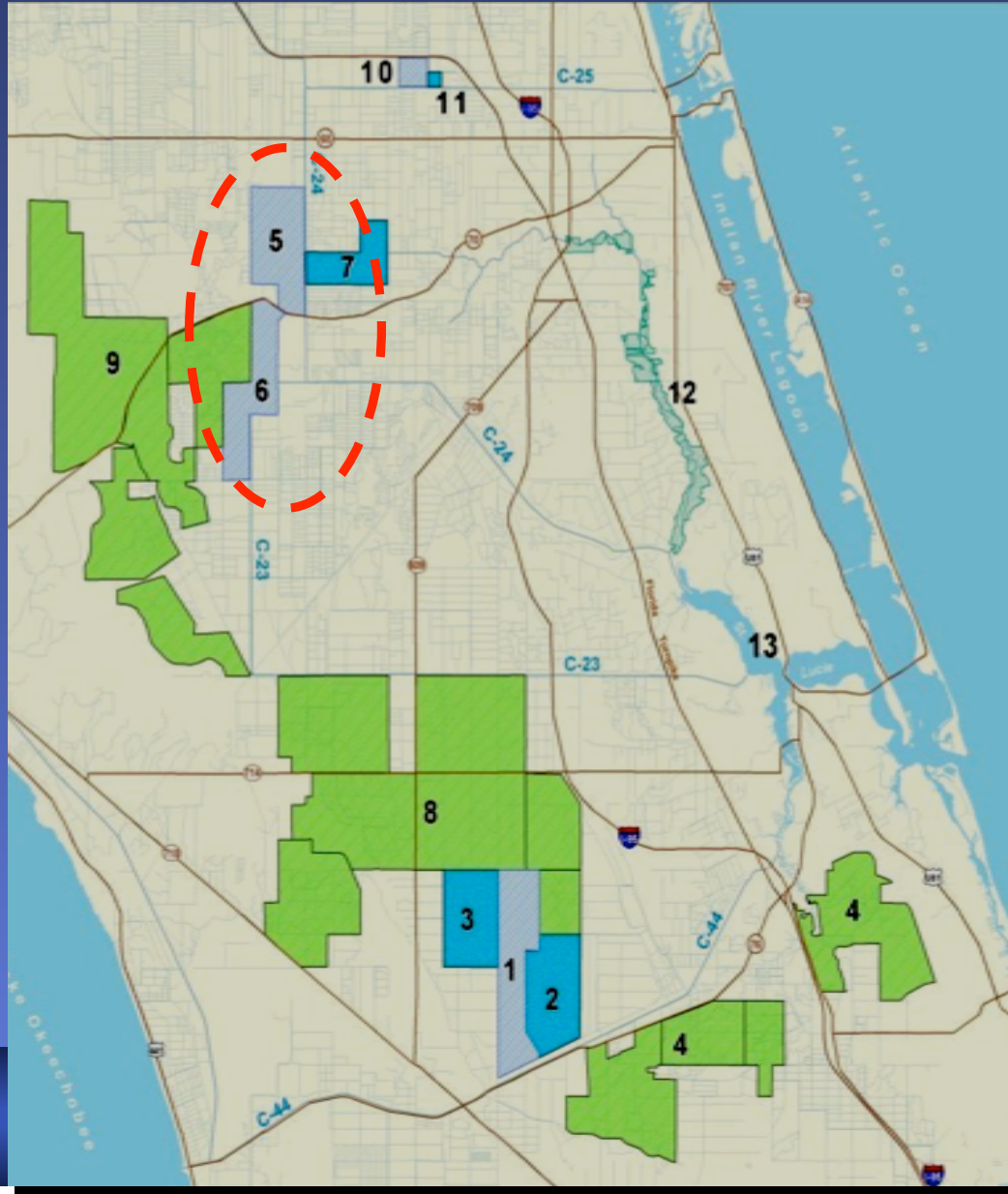
Major Basins and Ecologic Compartments



St. Lucie Estuary Watershed



# Indian River Lagoon-South Recommended Plan



## C-44 Basin

1. C-44 Reservoir
2. C-44 Stormwater Treatment Area (East)
3. C-44 Stormwater Treatment Area (West)
4. Palmar Complex – Natural Storage and Water Quality Area

## C-23/C-24 Basins

5. C-23/C-24 - North Reservoir
6. C-23/C-24 - South Reservoir
7. C-23/C-24 - Stormwater Treatment Area
8. Allapattah Complex – Natural Storage and Water Quality Area
9. Cypress Creek/Trail Ridge Complex - – Natural Storage and Water Quality Area

## C-25, North Fork & South Fork Basins

10. C-25 Reservoir
11. C-25 Stormwater Treatment Area
12. North Fork Natural Floodplain Restoration
13. Muck Remediation & Artificial habitat

- Reservoir
- Stormwater Treatment Area
- Natural Storage & Water Quality Area

# IRL–South Project Expected Benefits

- Reduce high volume discharges to improve salinity conditions for oyster and sea grass communities
- Provide more natural quantity, quality, timing and distribution of inflows to the estuary and restoring the North Fork of the St. Lucie River and its floodplain
- Improve habitat for larval, juvenile and adult fishes
- Improve water quality, reduce N and P loadings
- Improve water supply for agriculture
- Improve opportunities for tourism, recreation and environmental education



# Technical Approach

## Assumptions

- Since completion of the CERP Project Implementation Report in 2004, **new scientific information and models have been developed** to better characterize hydrology and salinity conditions within the North Fork of St Lucie River
- Includes development of new performance measures and flow targets for low flow conditions

# Resource-based Approach

## 5 Key Steps

1. Identify ecological compartments sensitive to a water reservation
2. Identify fish and wildlife resources to be protected
3. Identify performance measures and flow targets
4. Quantify water made available by the IRL-South Project
5. Identify quantity of water to be reserved to protect fish and wildlife



# Step 1: Identify Key Ecological Compartments

## Areas Considered:

### ■ Mid-Estuary

- The CERP PIR addressed damaging high volume flows and impacts to oysters and other estuarine biota (high flow issue)

### ■ Historical South Fork, St. Lucie River

- Although ecologically important, this compartment is not significantly affected by IRL-South Project features

### ☑ North Fork, St. Lucie River

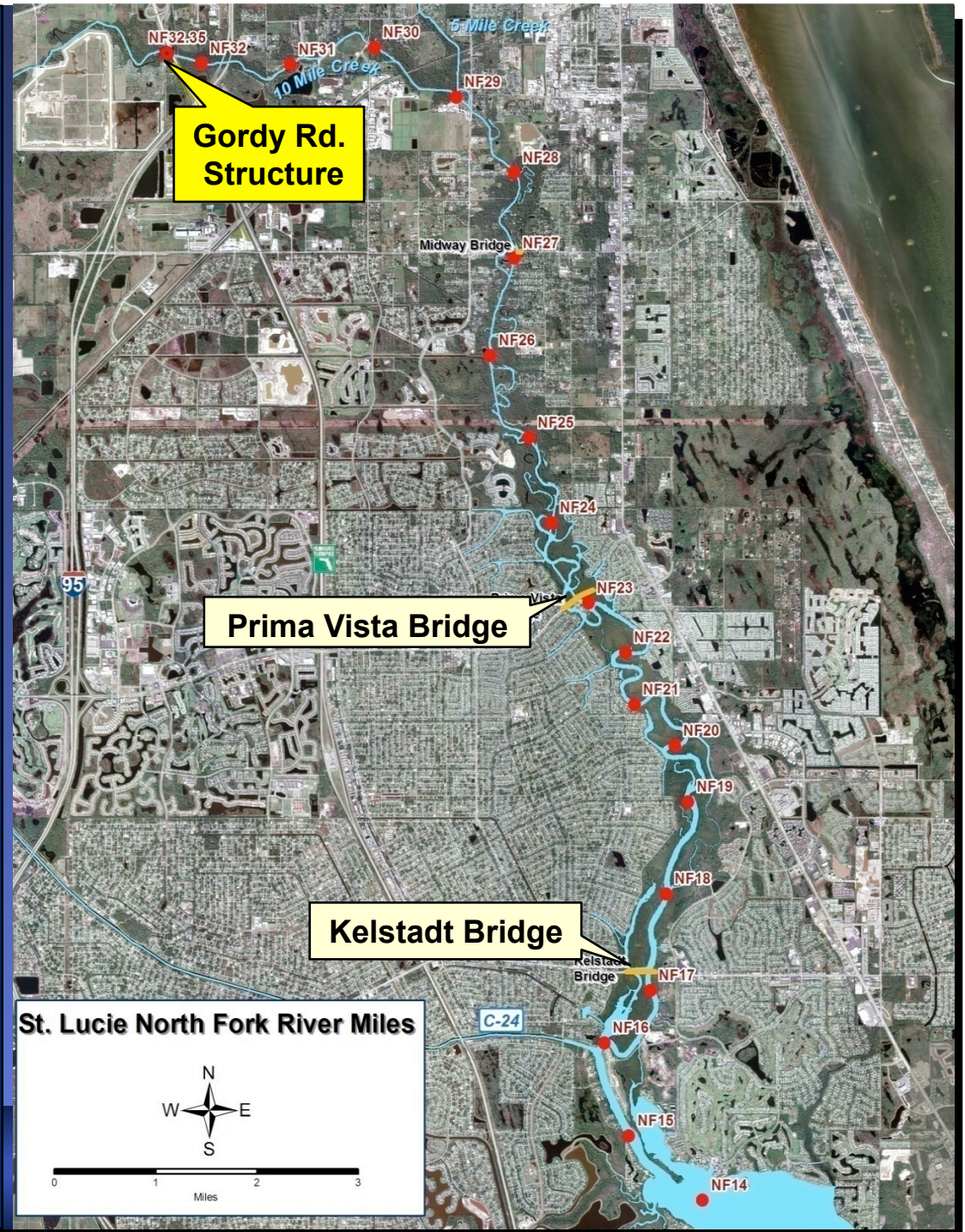
- Contains 17 linear miles of low salinity habitat, important as a nursery area for estuarine and marine organisms
- Compartment most affected by future IRL-South project flows, area most sensitive area to low flow conditions

# Map of North Fork, St. Lucie River

**RM00** River miles upstream from St. Lucie Inlet











 Water Management Structures

 Major Bridges

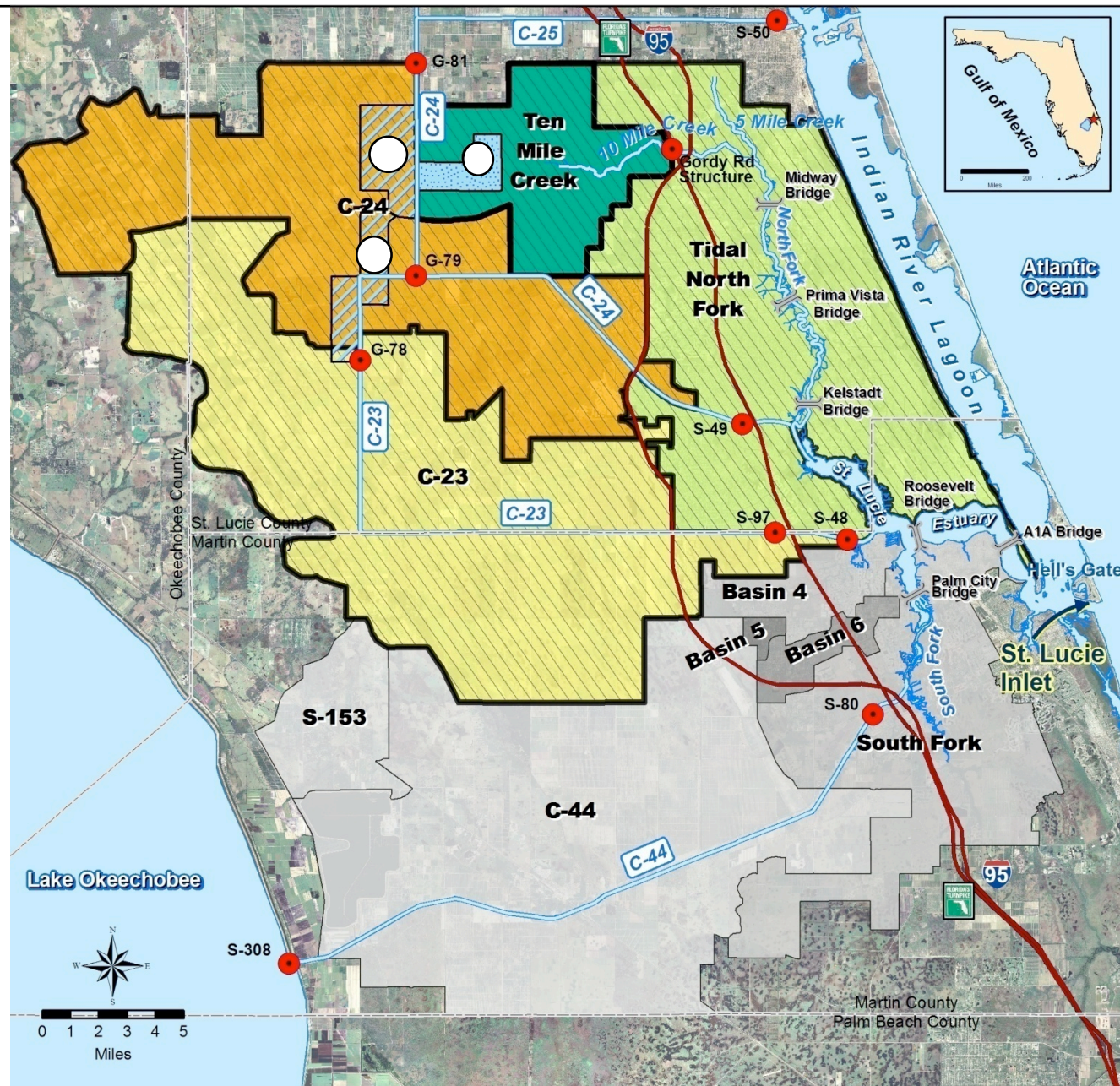




# Watershed Basins Contributing to North Fork, St. Lucie River Reservation Water Body

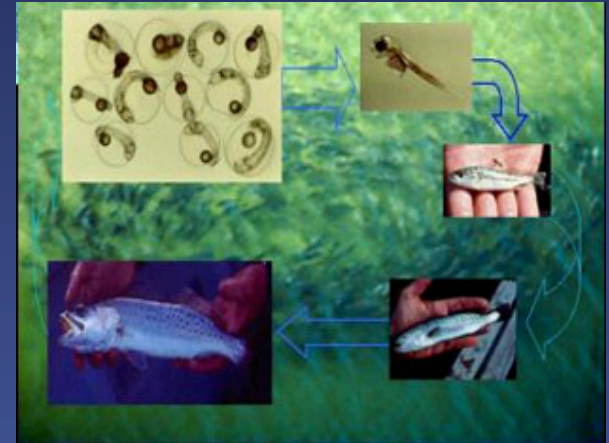
-  Water Reservation Basins
-  Non-contributing Basins
-  Water Control Structures
-  Major Canals
-  Bridges
-  Open Water
-  Major Highways
-  County Boundaries
-  STAs
-  Reservoirs

- ① C-23/24 North Reservoir
- ② C-23/24 STA
- ③ C-23/24 South Reservoir



## Step 2: Identify Fish and Wildlife Resources to be Protected

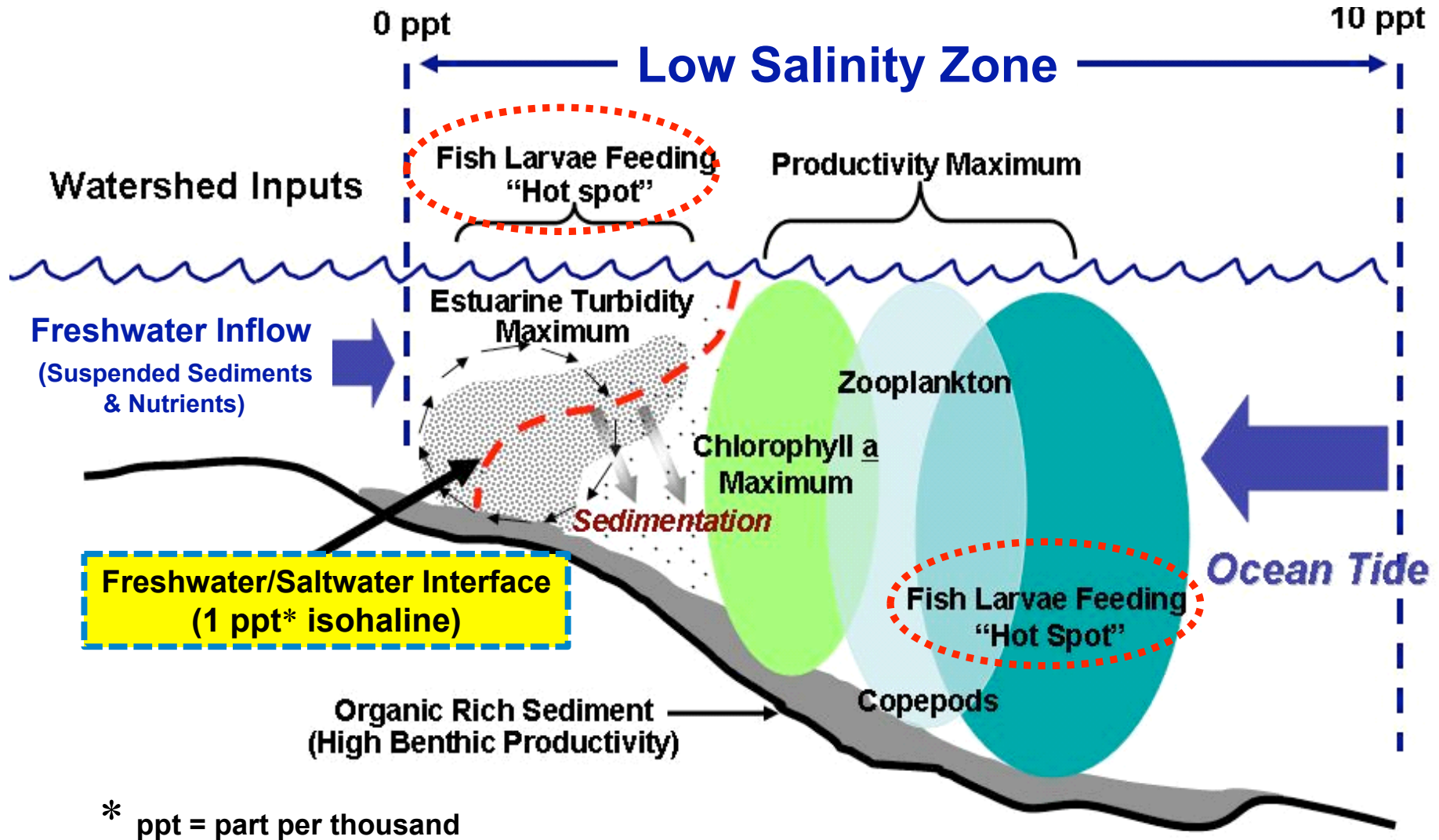
- A combination of the Valued Ecosystem Component Approach (USEPA 1987) and Habitat Overlap concept (Browder and Moore 1981)
- The selected Valued Ecosystem Component for the North Fork was the **Low Salinity Zone** which provides:
  - Important nursery habitat for larval and juvenile fishes and protection from marine predators
  - Habitat and forage for life cycles of many recreationally important species (Gilmore 2007)



*Spotted Seatrout Life Cycle:  
(Image from Grant Gilmore)*



# Conceptual Representation of the Low Salinity Zone in a Partially Mixed Estuary

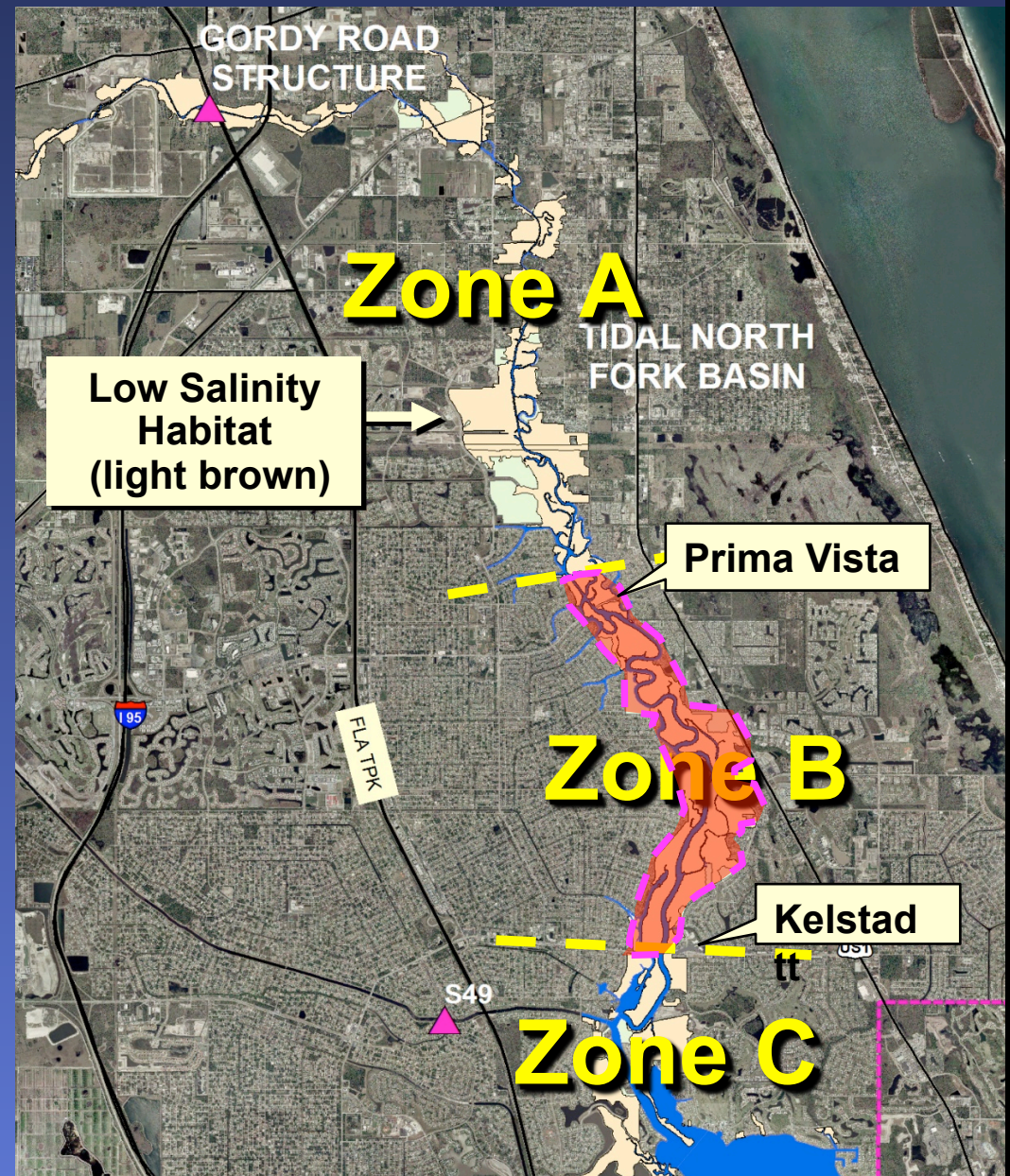


# GIS Analysis:

## Identify Preferred Location of Low Salinity Zone

Analyzed which area could maximize low salinity habitat:

- open water
- shoreline
- floodplain



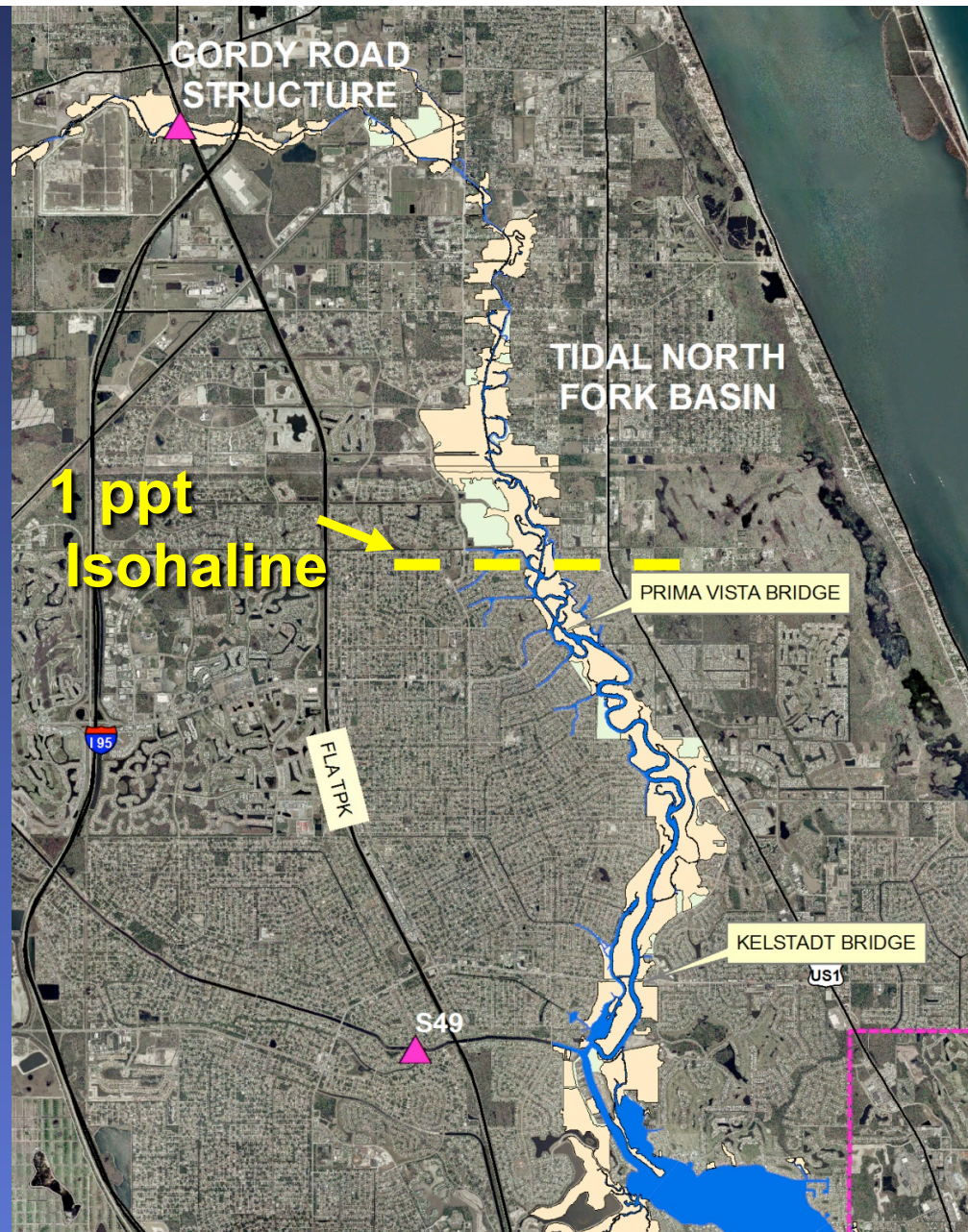
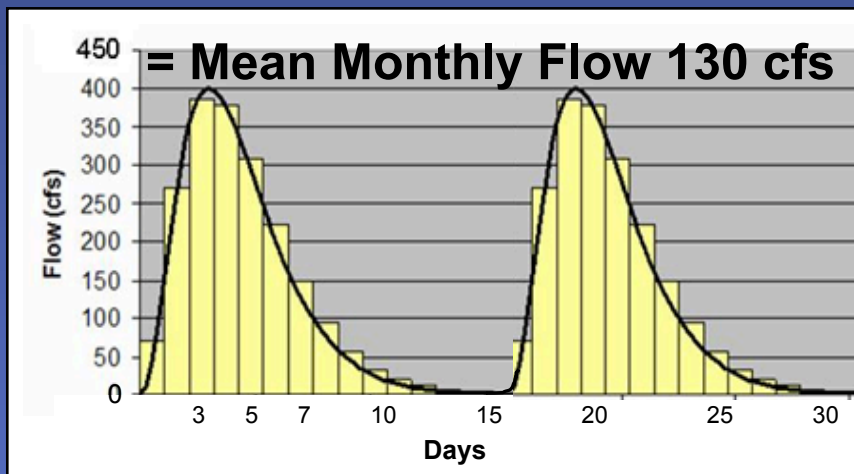


## Step 3: Identify Performance Measures and Targets

- **Performance Measure:** Maintain a dynamic distribution of the 1 ppt isohaline between the Prima Vista and Kelstadt bridges during dry season
- **Flow Target**
  - Natural rainfall (pulsed) inflows moves the 1 ppt isohaline to different locations within the river
  - A hydrodynamic (CH3D) model simulated pulsed flow releases to North Fork defining the volume water needed to move the 1 ppt isohaline to desired location
  - Pulse releases that equate to a mean monthly flow of 130 cfs during the dry season = Flow target

# CH3D Hydrodynamic Modeling Results

Model results for pulse releases at the Gordy Road Structure





## Step 4: Quantify Water Made Available by Project

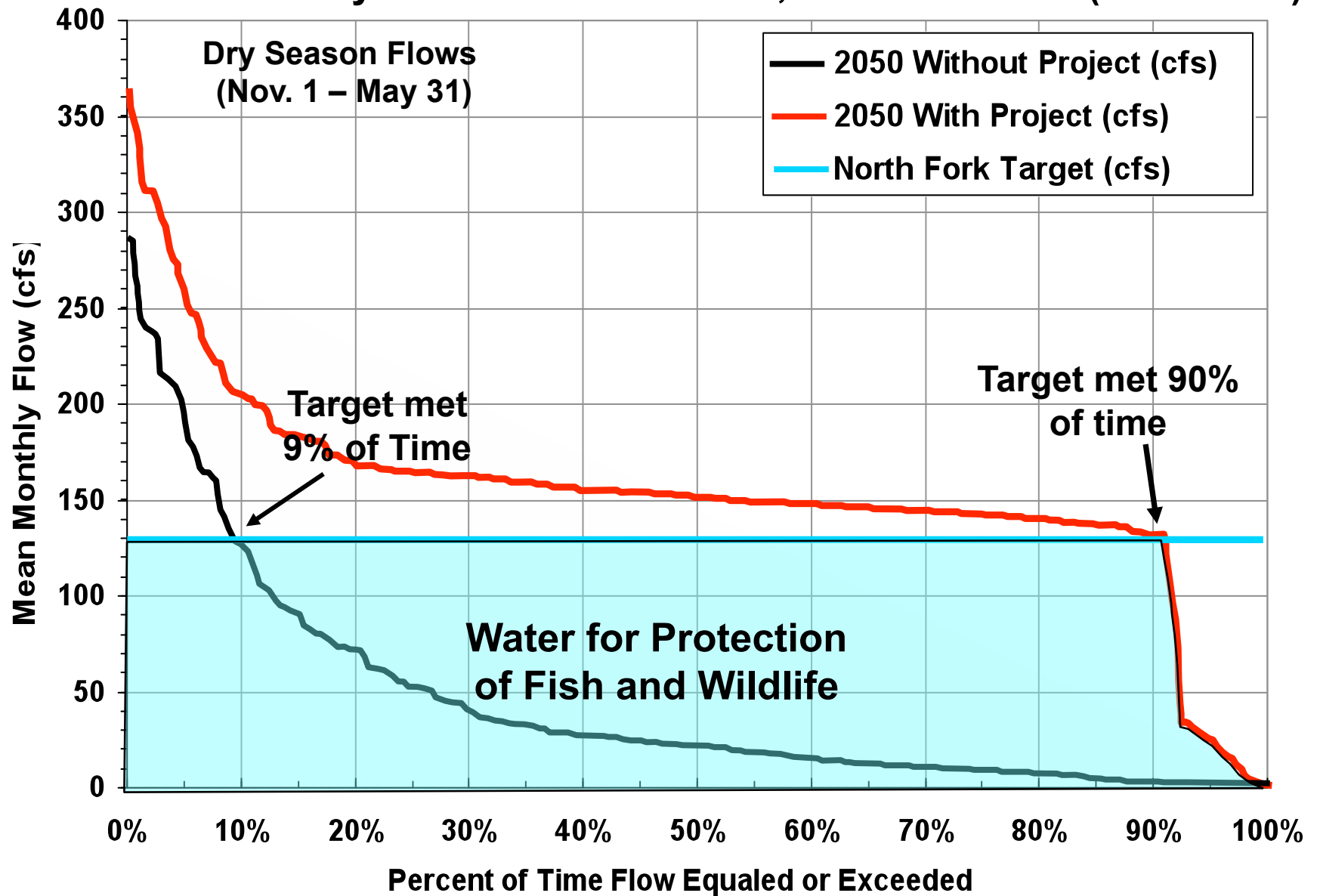
- To determine the volume of water made available by the project, an integrated modeling framework was used combining:
  - St. Lucie Estuary Watershed (WaSh) model
  - Reservoir Optimization (OPT16) model
- Products: 41-year time series of daily flows
  - 2050 Future without Project Condition
  - 2050 Future with Project Condition

## Step 5: Quantify the Volume of Water to be Reserved

- Convert 2050 Future with Project and 2050 Future without Project time series into **mean monthly flow** data and present as a Volume Probability Curve
- On the same graph, plot the **North Fork flow target** (dry season mean monthly flow of **130 cfs**)
- **All project water less than the target during the dry season** is needed to protect fish and wildlife



# Volume Probability Curve for North Fork, St. Lucie River (1965-2005)



# Scientific Peer Review

## ■ What was Reviewed?

- *Draft Technical Document to Support a Water Reservation Rule for the North Fork of the St. Lucie River, May 2009*

## ■ Scope of the Review?

- Determine if the proposed linkage between hydrology and the freshwater needs of fish and wildlife are scientifically sound
- Determine if best available information was used in the technical analysis used to develop draft document
- All data, methods, models, assumptions were subject to review



# Peer Review Panel Members

- Chairperson: William Seaman, Ph.D., Professor Emeritus, Fisheries and Aquatic Sciences, University of Florida
- Robert Diaz, Ph.D., Professor, Marine Science, Virginia Institute of Marine Sciences
- Winston Lung, Ph.D., P.E., Professor, Environmental and Water Engineering, University of Virginia
- Louis H. Motz, Ph.D., P.E., D. WRE, Associate Professor, Civil and Coastal Engineering, University of Florida

# Panel Findings

1. The report generally succeeds in documenting North Fork flow patterns using an approach that is overall “scientifically valid and uses currently accepted practices and concepts”
2. Designation of the Low Salinity Zone as key habitat to be protected is a suitable basis for guiding the freshwater requirements needed to sustain plankton, invertebrates and fish
3. The 1 ppt target is an ecologically defensible performance measure reinforced by the literature
4. “The analysis provided in the draft report provides a sound technical basis for reserving water to protect targeted fish and wildlife”



# Key Panel Recommendations

- Examples of additional information to include:
  - Monitoring plan
  - Table listing key species that use the Low Salinity Zone
  - Existing water quality and zooplankton data
  - Clarify open water boundary conditions (CH3D model)
  - Discuss uncertainty of OPTI-6 model
- Report to be finalized by October 2009 and distributed to public

# Questions?

